WATER POLLUTION SOURCES

Surface water pollution can be characterized as either "point source" or "nonpoint source." Point sources of water pollutants are identifiable sources that discharge pollutants into receiving waters, generally at a fairly steady rate. Nonpoint sources are more diffuse sources of pollutants that are generally associated with stormwater runoff. Such pollutants include: sediment from construction sites; the runoff of fertilizers, pesticides, and animal wastes from residential areas; atmospheric pollutants that are deposited on impervious surfaces and carried via stormwater runoff into surface water bodies; runoff of pollutants from roads and parking areas; motor oil and other pollutants that are dumped into storm drains, and litter. Stormwater runoff itself can adversely affect downstream water resources through stream bed and bank erosion (which can be a major source of sediment pollution) and through thermal impacts. Because of their diffuse nature, nonpoint source pollutants are generally more difficult to manage than point source pollutants.

Potential ground water contamination sources can include: septic fields; leaking underground storage tanks; other hazardous materials releases, including improper oil disposal; leachate from landfills and uncontrolled dump sites; leaking sewer lines; fertilizers; pesticides; road salt; agricultural wastes; and urban nonpoint source pollutants. In addition, radon is a naturally occurring substance, and it is not unusual for it to be present in groundwater sources in Fairfax County.

POINT SOURCE POLLUTANTS

VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM

Fairfax County is not characterized by heavy industry. Therefore, there are relatively few point sources of water pollution within the County. The Clean Water Act's National Pollutant Discharge Elimination System (NPDES) requires dischargers of wastewater into State waters to report these discharges and meet water quality requirements incorporated into their permits. In Virginia, the NPDES program is administered as the Virginia Pollutant Discharge Elimination System (VPDES) by the Virginia Department of Environmental Quality (VDEQ). Point source discharges are controlled by VDEQ and must meet all applicable State and federal water quality requirements.

The most significant point sources in Fairfax County are sewage treatment plants; two large treatment facilities are located in the County: the Noman M. Cole, Jr. Pollution Control Plant (NMCPCP), which is located in the southern portion of the County and which is operated by Fairfax County; and the Upper Occoquan Sewage Authority (UOSA) Water Reclamation Plant in the Centreville area.

The NMCPCP is a 54 million gallon per day (mgd) advanced wastewater treatment facility that incorporates preliminary, primary, secondary, and tertiary treatment processes to remove pollutants from wastewater generated by residences and businesses in Fairfax County. The original plant, which began operation in 1970 at a treatment capacity of 18 million gallons a day

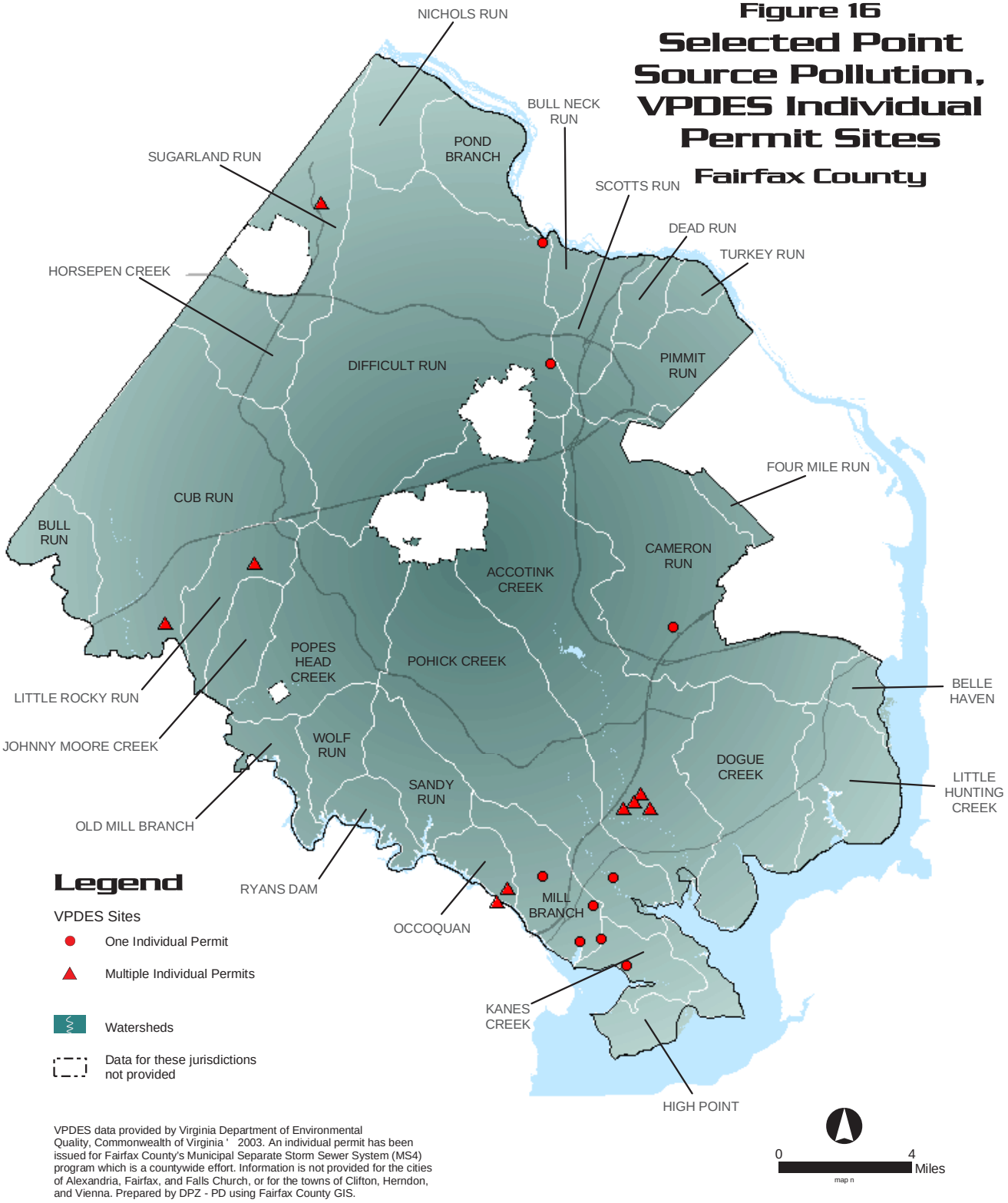
(mgd), has undergone two capacity and process upgrades to meet more stringent water quality standards. After treatment, the wastewater is discharged into Pohick Creek, a tributary of Gunston Cove and the Potomac River.

Construction to expand the plant treatment capacity to 67 mgd began in 1997, with completion planned by the end of 2004. This includes process upgrades to remove ammonia to less than 1 mg/l and total nitrogen to less than 8 mg/l in order to meet Virginia Water Quality Standards and the Chesapeake Bay Program goals for total nitrogen. Also included in the project are: flow equalization tanks, a new/upgraded laboratory for water quality testing, upgraded odor control systems, new instrumentation and control systems, and a new septage receiving facility. The recent plant upgrades have incorporated biological nutrient removal (BNR); the plant now removes almost 100% of the ammonia from plant influent wastewater, and the plant's effluent has been certified to be free of toxics by an independent lab, as required by the facility's VPDES permit.

As noted earlier, UOSA's Water Reclamation Facility was placed into service in 1978, pursuant to the Virginia State Water Control Board's 1971 Occoquan Policy, which called for the phasing out of small, outdated sewage treatment facilities in the Occoquan Watershed in favor of no more than three state-of-the-art advanced water reclamation plants. The UOSA facility serves the western portions of Fairfax and Prince William Counties, as well as the Cities of Manassas and Manassas Park. UOSA staff has noted that the Water Reclamation Plant includes primary-secondary treatment followed by the following advanced waste treatment processes: chemical clarification, two-stage recarbonation with intermediate resettling, multimedia filtration, granular activated carbon adsorption, post carbon filtration, chlorination for disinfection, and dechlorination. The plant's capacity is 32 million gallons a day (mgd) and is being expanded to a capacity of 54 mgd. The plant expansion has been largely completed.

More than 85% of the County's households and nearly all businesses in the County are connected to public sewer. The Wastewater Planning and Monitoring Division (WPMD) of the Department of Public Works and Environmental Services has indicated that the current 12-month rolling average flow to NMCPCP is 44.3 million gallons per day (MGD). Approximately 12.5 MGD is conveyed from the County to the UOSA facility. Three other facilities to which wastewater from the County is conveyed are located outside of the County. The Blue Plains facility, which is operated by and located in the District of Columbia, collects wastewater from sewered areas in the northern portion of the County, including the Tysons Corner, McLean, Reston, and Herndon areas. The current 12-month rolling average flow from Fairfax County to Blue Plains is 28.5 MGD. Wastewater from much of the area inside the Capital Beltway in and south of the Falls Church area (with the exception of portions of the Annandale and Baileys Crossroads areas) is conveyed to a facility operated by the Alexandria Sanitation Authority. Wastewater from portions of the Springfield, Franconia, and Rose Hill areas, as well as portions of the County located along the Richmond Highway Corridor and the George Washington Memorial Parkway south of the City of Alexandria, is also conveyed to this facility. The 12-month rolling average flow from the County to this facility is 22.2 MGD. A small portion of the County in the Baileys Crossroads area is served by a facility operated by Arlington County; approximately 2.2 MGD is conveyed from the County to this facility.

Figure 16
Selected Point Source Pollution, VPDES Individual Permit Sites
Fairfax County



VPDES data provided by Virginia Department of Environmental Quality, Commonwealth of Virginia ' 2003. An individual permit has been issued for Fairfax County's Municipal Separate Storm Sewer System (MS4) program which is a countywide effort. Information is not provided for the cities of Alexandria, Fairfax, and Falls Church, or for the towns of Clifton, Herndon, and Vienna. Prepared by DPZ - PD using Fairfax County GIS.

Wastewater treatment facilities and other facilities that discharge more than 1,000 gallons per day of wastewater are required to obtain individual VPDES permits from the VDEQ. VDEQ has issued 47 Individual Permits to 19 different facilities/permittees in Fairfax County, including the two sewage treatment plants identified above, additional, much smaller, sewage treatment facilities (including two that have yet to have been constructed), pipeline facilities, petroleum storage terminals, water treatment facilities, the County's Municipal Separate Storm Sewer System permit (addressing nonpoint sources but categorized as an Individual VPDES Permit), and other dischargers. Figure 16 displays the locations of these discharges.

In addition to Individual VPDES Permits for discharges of greater than 1,000 gallons per day, VDEQ issues General Permits for a variety of activities involving lesser volumes of discharge. Included are: General Permits for Cooling Water (associated with the purging of boiler systems in large buildings and the associated discharge of water into storm drains); Storm Water Construction (permits required for construction sites or other land disturbances that exceed five acres in size); Storm Water Industrial (stormwater runoff from landfills, asphalt plants, other industrial activities, vehicle storage/maintenance yards, and other facilities); Non-Metallic Mineral Mining (quarries); Ready-Mix Concrete (concrete batching plants); Municipal Separate Storm Sewer System permits for smaller jurisdictions; and otherwise unclassified General Permits. A recently enacted state law will require Fairfax County to assume responsibility for stormwater construction permits in the future.

TABLE 5
VPDES General Permits in Fairfax County Issued by VDEQ
December, 2003

Type of General Permit	Number
Storm Water Construction	291
Storm Water Industrial	38
Ready-Mix Concrete	19
Cooling Water	19
Non-Metallic Mineral Mining	8
Municipal Separate Storm Sewer System	4
Other (less than 1,000 gallons per day)	4
TOTAL	383

Source: Virginia Department of Environmental Quality
Includes permits issued in Fairfax City, the City of Falls Church, and the Towns of Herndon and Vienna
The numbers above reflect all General Permits that have been issued by VDEQ. In many cases, multiple permits have been issued to individual facilities; these multiple permits are not consolidated in the data provided in this table.

In Fairfax County, a total of 383 General Permits have been issued by VDEQ, broken down as presented in Table 5. A distribution of General Permits by watershed in Fairfax County is provided in Figure 17. It should be noted that the data provided to the County by VDEQ includes points of discharge located in Fairfax and Falls Church Cities and in the Towns of

Figure 17
Virginia Pollutant Discharge Elimination System Permit Type by Watershed

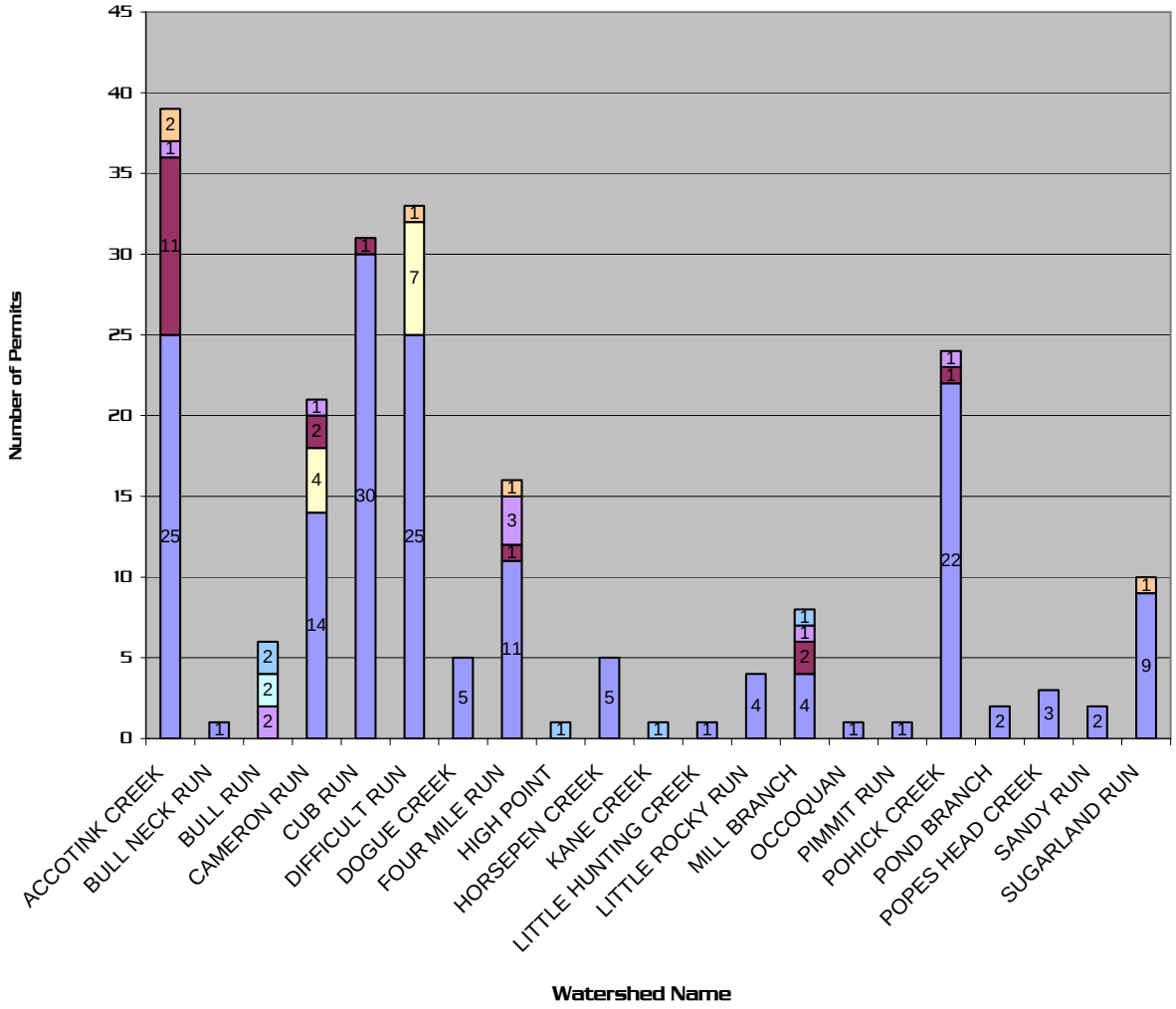


Chart contains only watersheds with permits, not all watersheds. Source: Virginia Department of Environmental Quality

LEGEND

- *MS4 General Permit
- Less Than 1,000 GPD General Permit
- Non-Metalic Mineral Mining General Permit
- Ready-Mix Concrete General Permit
- Storm Water Industrial General Permit
- Cooling Water General Permits
- Storm Water Construction General Permit

*MS4 information includes data from the city of Fairfax, and the Towns of Clifton, Herndon, and Vienna. VPDES data provided by Virginia Department of Environmental Quality, Commonwealth of Virginia © 2003. Prepared by DPZ - PD using Fairfax County GIS.

map_n

Herndon and Vienna. It should also be noted that individual facilities may have more than one VPDES permit; as an example, there have been eight Non-Metallic Mineral Mining General Permits issued to the two stone quarries in the County.

TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) AND SPILL RESPONSE

The federal Superfund Amendments and Reauthorization Act (SARA) of 1986 included a provision known as the "Emergency Planning and Community Right-to-Know Act," otherwise referred to as "Title III." This law requires facilities that manufacture, process, or store certain hazardous or toxic chemicals above certain threshold levels to report to state and local governments and to report releases of certain hazardous materials in a timely manner. There are five reporting programs under Title III of SARA as follows:

- Section 302, Emergency Planning Notification: This provision requires facilities that have "Extremely Hazardous Substances" in quantities exceeding EPA-established "threshold planning quantities" to notify the Virginia Emergency Response Council (VERC) and the Local Emergency Planning Committee (LEPC). The Fairfax Joint Local Emergency Planning Committee (FJLEPC) refers to these facilities as "Critical Hazard Facilities." There have been 90 such facilities (plus four bulk storage facilities) identified in the 2003 Hazardous Materials Emergency Response Plan (covering calendar year 2002) in the geographic area covered by FJLEPC. More information about these facilities is provided below.

- Section 304, Emergency Release Notification: This provision requires, with some exemptions, facilities to notify VERC, the local LEPC, and the local fire department regarding the release of any Extremely Hazardous Substances at or above specific "reportable quantities." These agencies, along with the National Response Center (operated by the National Guard) must also be notified regarding the release of hazardous substances (again at or above "reportable quantities") that are listed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

- Section 311, Material Safety Data Sheet (MSDS) Submission: This provision requires, with some exemptions, facilities to provide information, if requested, to VERC, local LEPCs, and local fire departments regarding chemicals requiring reporting under the Occupational Safety and Health Administration (OSHA) hazard communication standard.

- Section 312, Emergency and Hazardous Chemical Inventory (also known as "Tier II Reporting): This provision requires annual submissions of "Tier II" reports to VERC, local LEPCs, and local fire departments regarding hazardous materials that are present at or above certain quantities. The "Extremely Hazardous Substances" referenced in Section 302 are a subset of the larger list of hazardous materials covered under this Section. The Tier II form includes information regarding the types and quantities of hazardous materials on the site, how these chemicals are used and stored, and points of contact at each facility. As is the case with Section 311, retail gas stations that comply with underground storage tank requirements and that hold less than 75,000 gallons of

gasoline or 100,000 gallons of diesel fuel are exempt from this requirement. In Fairfax County, 463 facilities were required to submit Tier II reports in the year 2003, including all of the Critical Hazard Facilities and bulk storage facilities.

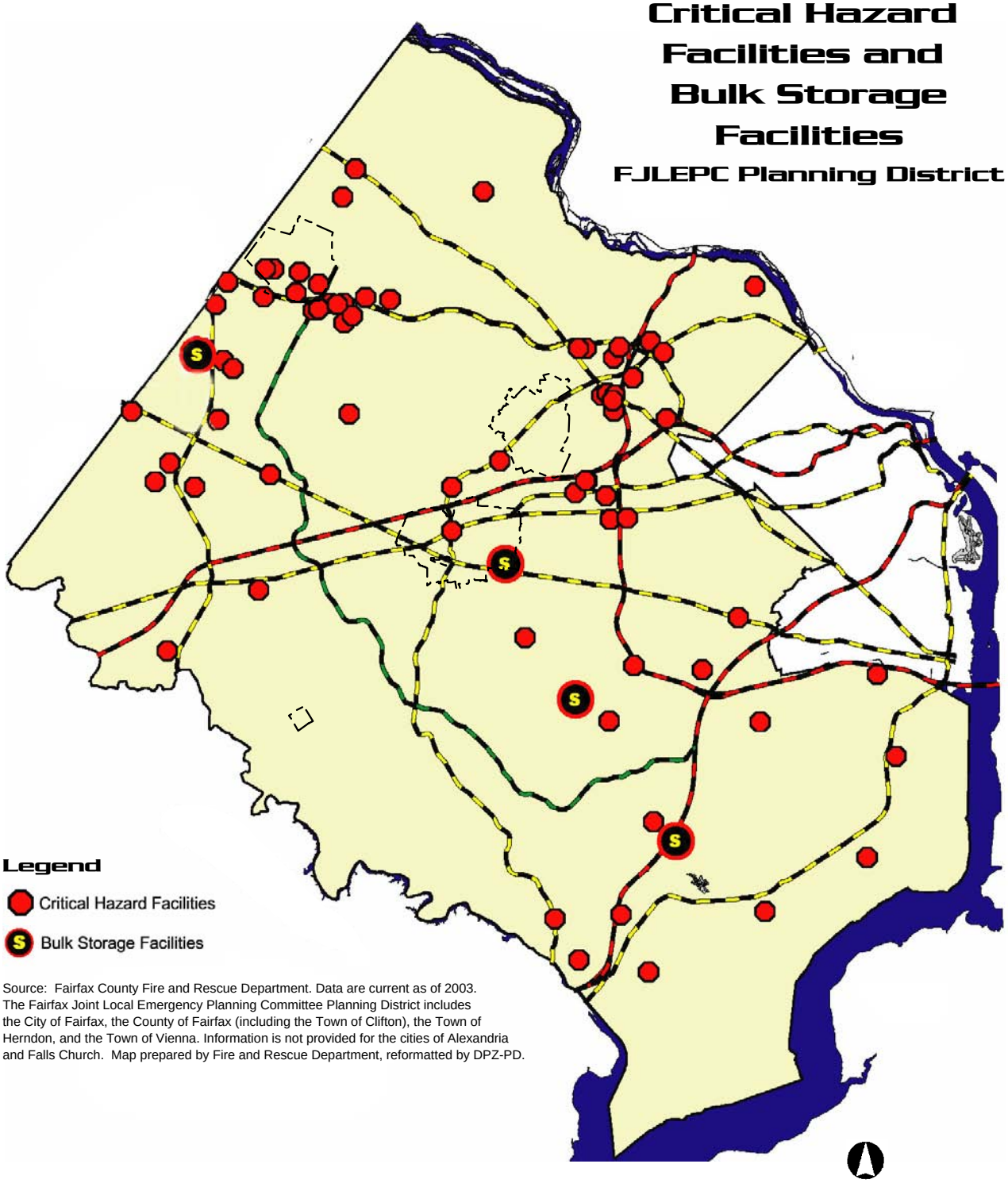
- Section 313, Toxics Release Inventory: This provision requires certain industrial facilities to report to VERC and the U.S. Environmental Protection Agency regarding the manufacturing, processing, use, and/or release of any toxic chemical in excess of certain thresholds during the course of a calendar year (including releases that are allowed through permits). In the year 2002, twelve facilities in Fairfax County and two in Fairfax City filed such reports with the Virginia Department of Environmental Quality.

The Virginia Department of Environmental Quality (VDEQ) receives all Title III notification reports submitted in Virginia on behalf of VERC. In Fairfax County, the Fire and Rescue Department also retains copies of these reports (with the exception of Toxics Release Inventory reports) and coordinates activities of the Fairfax Joint Local Emergency Planning Committee (FJLEPC).

Title III of SARA also requires states to organize emergency planning areas and to establish Local Emergency Planning Committees (LEPCs) to provide for community representation in the development and coordination of emergency response plans addressing potential chemical releases. The FJLEPC Planning District includes the City of Fairfax, the County of Fairfax (including the Town of Clifton), the Town of Herndon, and the Town of Vienna. Committee members represent local government officials, police, fire and rescue officials, environmental and governmental planners, public health professionals, hospital officials, public utility and transportation officials, representatives of business organizations, professional societies, civic organizations, and the media. These representatives meet six times a year. The FJLEPC collects information about hazardous materials; develops and updates, on an annual basis, the Hazardous Materials Emergency Response Plan (HMERP); and provides information to the public about the use, storage, and manufacture of hazardous materials by attending public functions such as Fall for Fairfax and USGS (U. S. Geological Survey) Safety Day. In addition, the Committee has published three brochures and has produced a video tape, all for public information.

As noted above, there were a total of 463 facilities in FJLEPC's geographic area that were required to file "Tier II" reports in the year 2003 under Section 312 of SARA Title III. Ninety of these facilities have been identified in the 2003 HMERP as "Critical Hazard Facilities," which are described in the report as those facilities "which are considered most likely to release a hazardous material into the community." Roughly 20 of these facilities will not be considered as Critical Hazard Facilities in the 2004 report as a result of a resurvey conducted by a telecommunications firm that operates these facilities. In addition to the 90 Critical Hazard Facilities, the 2003 report identifies four bulk storage facilities such as petroleum tank farms. The majority of the remaining Tier II facilities store gasoline or diesel fuel (e.g., County schools) and are not otherwise exempted from reporting (e.g., most gas stations have been exempted from this reporting requirement). Figure 18 displays the general locations of the Critical Hazard

Figure 18
Critical Hazard Facilities and Bulk Storage Facilities
FJLEPC Planning District



Source: Fairfax County Fire and Rescue Department. Data are current as of 2003. The Fairfax Joint Local Emergency Planning Committee Planning District includes the City of Fairfax, the County of Fairfax (including the Town of Clifton), the Town of Herndon, and the Town of Vienna. Information is not provided for the cities of Alexandria and Falls Church. Map prepared by Fire and Rescue Department, reformatted by DPZ-PD.

Facilities and bulk storage facilities. As can be seen from this map, Critical Hazard Facilities are generally concentrated in "high tech" corridors such as Tysons Corner and the Reston-Herndon area.

For each Critical Hazard Facility and bulk storage facility identified in the HMERP, the HMERP describes the extremely hazardous substances that are used or stored and discusses notification procedures in the event of an incident, on site means of detecting incidents, evacuation routes, clean-up resources, and identification of parties responsible for the site. The majority of the facilities identified in the HMERP are listed because of batteries that are used in support of wireless telecommunications facilities; these batteries contain quantities of sulfuric acid that exceed the threshold planning quantity for this chemical. A number of other facilities use batteries that exceed the threshold planning quantity for sulfuric acid for the purpose of ensuring that there will be an uninterrupted power supply for computers and/or general operations. Other common chemicals are anhydrous ammonia and chlorine.

The County's Fire and Rescue Department (FRD) responds to all reported incidents of hazardous material releases, spills, and discharges. FRD Operations Division staff is trained and equipped to initiate spill control measures to reduce the possibility of hazardous materials reaching streams and other sensitive resources. FRD also maintains a contract with a major commercial hazardous materials response company to provide additional containment and cleanup support for larger-scale incidents.

The Hazardous Materials and Investigative Services (HMIS) Section of FRD investigates complaints of potential and actual releases, many of a non-emergency nature. Approximately 500 investigations of oil or other liquid spills are conducted each year. HMIS staff, through vigorous enforcement of appropriate codes and ordinances, ensures that the responsible parties take appropriate spill control and cleanup actions. HMIS also provides for long-term monitoring of sites that have been subject to contamination in order to minimize the potential for the movement of contaminants into the County's water resources.

NONPOINT SOURCE POLLUTANTS

While Fairfax County contains several point sources of water pollutants, nonpoint source pollution has had a much more profound influence on the current condition of the County's water resources. The rapid growth in the County's population and employment in the latter half of the 20th Century, continued growth in the early part of the 21st Century, and the associated land use changes that were outlined in the first section of this report have changed the character of stormwater runoff in Fairfax County dramatically. Watersheds and subwatersheds that were once characterized by forests, farmland, and other pervious cover are now largely developed. Some rainfall that, at one time, could infiltrate through pervious surfaces into the groundwater system is now intercepted by impervious surfaces and conveyed into streams. This stormwater runoff has changed the hydrologic characteristics of the receiving streams, resulting in stream bed and bank erosion and the conveyance of sediment into downstream areas. In addition, stormwater runoff from both impervious and pervious areas carries with it pollutants that have accumulated on these surfaces, whether the pollutants are pesticides and fertilizers applied to turf areas, metals and hydrocarbons that have accumulated on roads and parking areas, or sediment

that has been entrained and carried downstream from development sites. It should be stressed that the land conversions that have occurred in response to population and employment growth in the County have not necessarily or uniformly been "bad" from a water quality standpoint; to the contrary, land has been used throughout Fairfax County, and water pollutants have been generated from these uses, since Colonial times. It should be recognized, however, that the character of this runoff has changed significantly as the County has evolved from an agricultural community to the vibrant employment center it has become today, and that this change in character continues to present substantial stresses to the County's water resources.

Within the watershed of the Potomac River and the larger Chesapeake Bay watershed, both agricultural and urban/suburban nonpoint sources of pollution are significant concerns. However, the extent of agricultural use of land in Fairfax County has dwindled substantially as the County has evolved. The 1930 U.S. Census, for example, identified 1,244 farms in Fairfax County, covering 123,626 acres of land. The 2002 Census of Agriculture, by contrast, identified 151 farms covering 9,946 acres. Clearly, when considered in a broad context, traditional agricultural uses (i.e., cropland, dairy farming, and livestock operations) are no longer a substantial nonpoint source pollution issue in Fairfax County.

The character of agricultural uses in Fairfax County has shifted from the traditional forms of agriculture noted above to residential horse operations; according to the Northern Virginia Soil and Water Conservation District (NVSWCD), a preponderance of agricultural land in Fairfax County is now associated with such operations. Agricultural uses that remain in Fairfax County are subject to soil and water conservation planning requirements of the Chesapeake Bay Preservation Ordinance. It is noted that the County's Ordinance defines "agricultural land" broadly to include plant nurseries and properties on which horses are maintained. Conservation planning for such uses can result in significant reductions in pollutant runoff, and NVSWCD develops soil and water conservation plans for all agricultural land as defined by the Ordinance. The plans include best management practices to reduce sediment pollution from erosion, excess nutrients from animal waste and fertilizers, and misuse of pesticides and herbicides. The plans also prescribe riparian buffers for Resource Protection Areas. Per a County ordinance requirement, soil and water conservation plans are also developed for Agricultural and Forestal Districts in the County (of which there were 42 in 2003). NVSWCD also develops conservation plans for landowners receiving state cost-share money for installing agricultural best management practices, such as manure storage and composting structures, or fencing to keep animals out of streams. In addition to cost share practices, landowners voluntarily install best management practices that protect water quality. In 1999 and 2000, NVSWCD worked with landowners to achieve runoff reductions of 7,191 pounds of nitrogen and 838 pounds of phosphorus; these reductions met the state's Potomac Watershed Tributary Strategy goals for agriculture in Fairfax County.

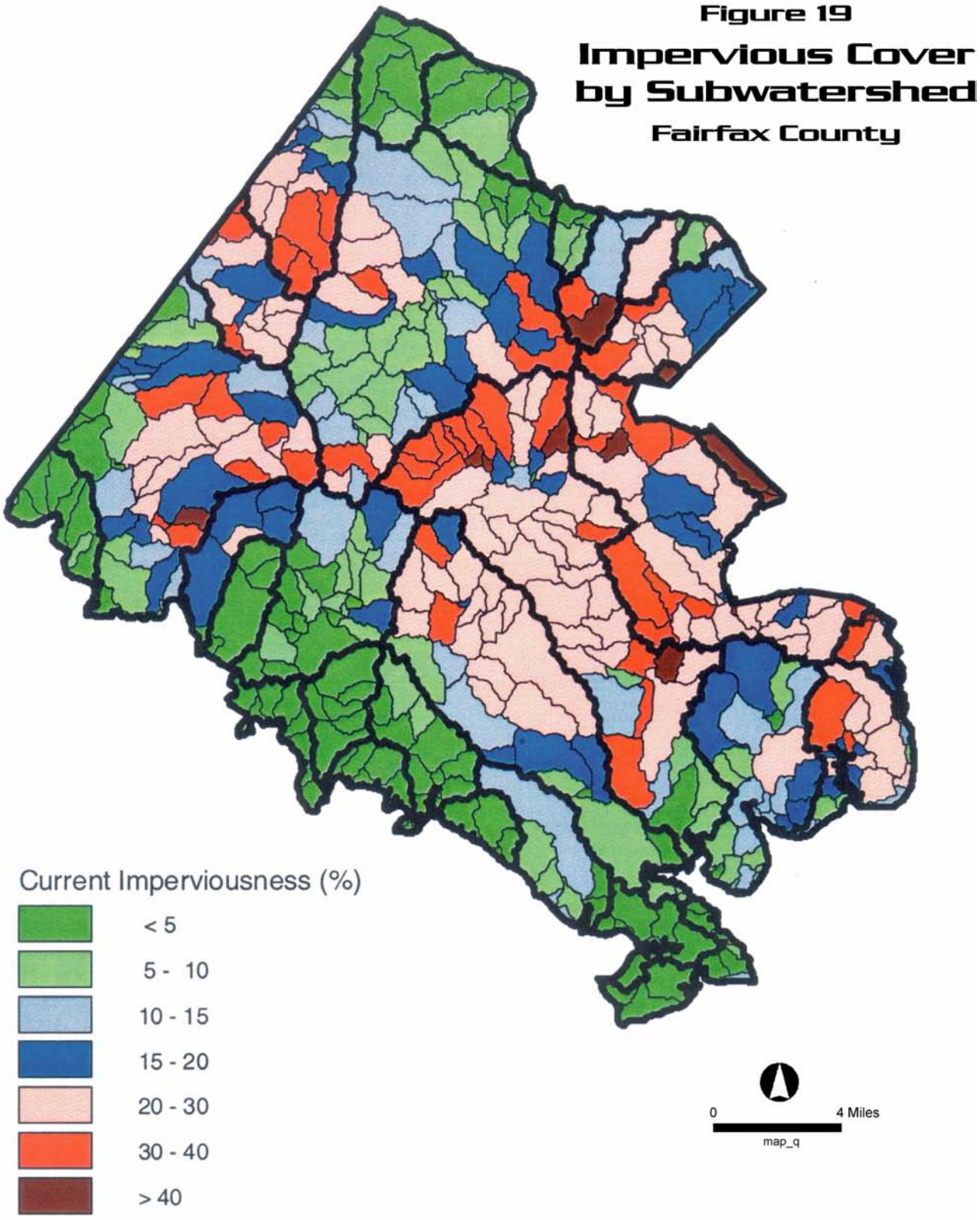
Since 1994, when soil and water conservation plans began to be developed in support of the Chesapeake Bay Preservation Ordinance, such plans have been drafted for 9,859 acres of land and 260,091 linear feet of RPAs. It should be noted, however, that some of these plans are no longer active due to conversion of agricultural land to other uses. In addition, there are many additional parcels of land in agricultural use for which soil and water conservation planning is still needed.

Of particular note regarding nonpoint source pollution is the issue of stormwater runoff hydrology. As watersheds and subwatersheds become more impervious, infiltration of water into the ground decreases, thereby reducing the volumes of water that percolate downward and replenish the groundwater system. This, in turn, can reduce the base flow that this groundwater system provides to streams. Potentially, streams that are supplied by spring water can lose this source of constant flow as the water table drops and change from perennial streams to intermittent streams.

The reduction in infiltration into the soil that is associated with increased impervious cover is countered by an increase in stormwater runoff at the surface. Water that once reached the stream through slow percolation and movement in the ground is now conveyed rapidly into the stream over the surface (assuming that the drainage is not conveyed into a stormwater detention or retention facility). The character of stormwater runoff at the surface also changes, as runoff is conveyed more rapidly into streams when it is conveyed over impervious surfaces and pipes rather than vegetative surfaces. The effect of increased impervious cover, then, is a "flashier" flow characteristic in the receiving stream. The total volume of water entering the stream is higher than it was under pervious conditions, and the peak volume in the stream is much higher, and occurs much earlier, than it did under pervious conditions. The frequency and intensity of flash flooding increases. Because the morphology, or form, of the stream had developed over time to accommodate the hydrologic conditions associated with a pervious cover, the stream becomes imbalanced as the character of the hydrology changes. To accommodate the higher peak and total volumes of flow, the channel deepens and widens through stream bed and stream bank erosion; additional sediment is conveyed into downstream areas (and ultimately the Potomac River and Chesapeake Bay).

Impervious cover can also increase the temperature of stormwater runoff entering streams, as broad, unshaded paved surfaces can become much hotter than areas characterized by a turf or forest cover. There is also a direct correlation between impervious cover and runoff of natural and man-made pollutants, including hydrocarbons and metals from roads and parking lots and nutrients that can cause high algal growth in downstream waters such as the tidal Potomac River and Chesapeake Bay (the algal growth degrades habitat by blocking sunlight and by reducing dissolved oxygen concentrations as the algae decay—this is why the reduction in nutrient loads has been a central component of Chesapeake Bay restoration efforts). The flashier stormwater runoff hydrology, increased temperature fluctuations, and pollutants that may be associated with runoff from impervious surfaces all can have a detrimental impact to aquatic species that inhabit streams, and there is a clear relationship between impervious cover in a watershed or subwatershed and the ecological quality of the stream system. Thomas Schueler, an authority on this relationship, has developed a three-tier description to characterize this impact: streams in watersheds with an impervious cover of ten percent or less tend to be rich in biodiversity and have good water quality characteristics. These streams are considered to be "sensitive." Streams in watersheds with 11 to 25 percent impervious cover demonstrate instability in their channels; they retain some biodiversity but do not have species that are particularly sensitive to hydrologic changes and stream pollutants and therefore are not as rich in biodiversity as the "sensitive" streams; these streams are considered to be "impacted." Streams in watersheds with more than

Figure 19
Impervious Cover by Subwatershed
Fairfax County



Source: Fairfax County Department of Public Works & Environmental Services, 2004. Current imperviousness is based on 1997 planimetric data.

25% impervious cover are characterized as "degraded," with unstable channels and low stream biodiversity.

Figure 19 identifies the current imperviousness of each subwatershed area in Fairfax County, based on 1997 planimetric data. As can be seen in this figure, subwatersheds throughout much of Fairfax County exceed 10% impervious cover. In general, the watersheds that retain more than 90% of their pervious cover are located in: the areas of the Occoquan Watershed that have been zoned for five-acre lot residential development; the Great Falls area in northern Fairfax County; the Difficult Run Watershed in the west-central part of the County; the Mason Neck peninsula in the southern part of the County; and portions of the Pohick, Accotink, and Dogue Creek Watersheds in southern Fairfax County. Impervious cover values well in excess of 30% characterize many of the subwatersheds throughout other portions of the County. As will be discussed later in this report, there is a strong relationship between subwatershed impervious cover and habitat values of streams in Fairfax County.

Much of the focus of the County's water resource management efforts has been related to the issue of impacts of impervious cover and to the control of nonpoint source pollution; the recently-initiated efforts to develop watershed management plans for all of the County's watersheds and to reevaluate stormwater management policies are both largely driven by the impacts associated with the development of the County. These efforts are discussed in detail later in this report.

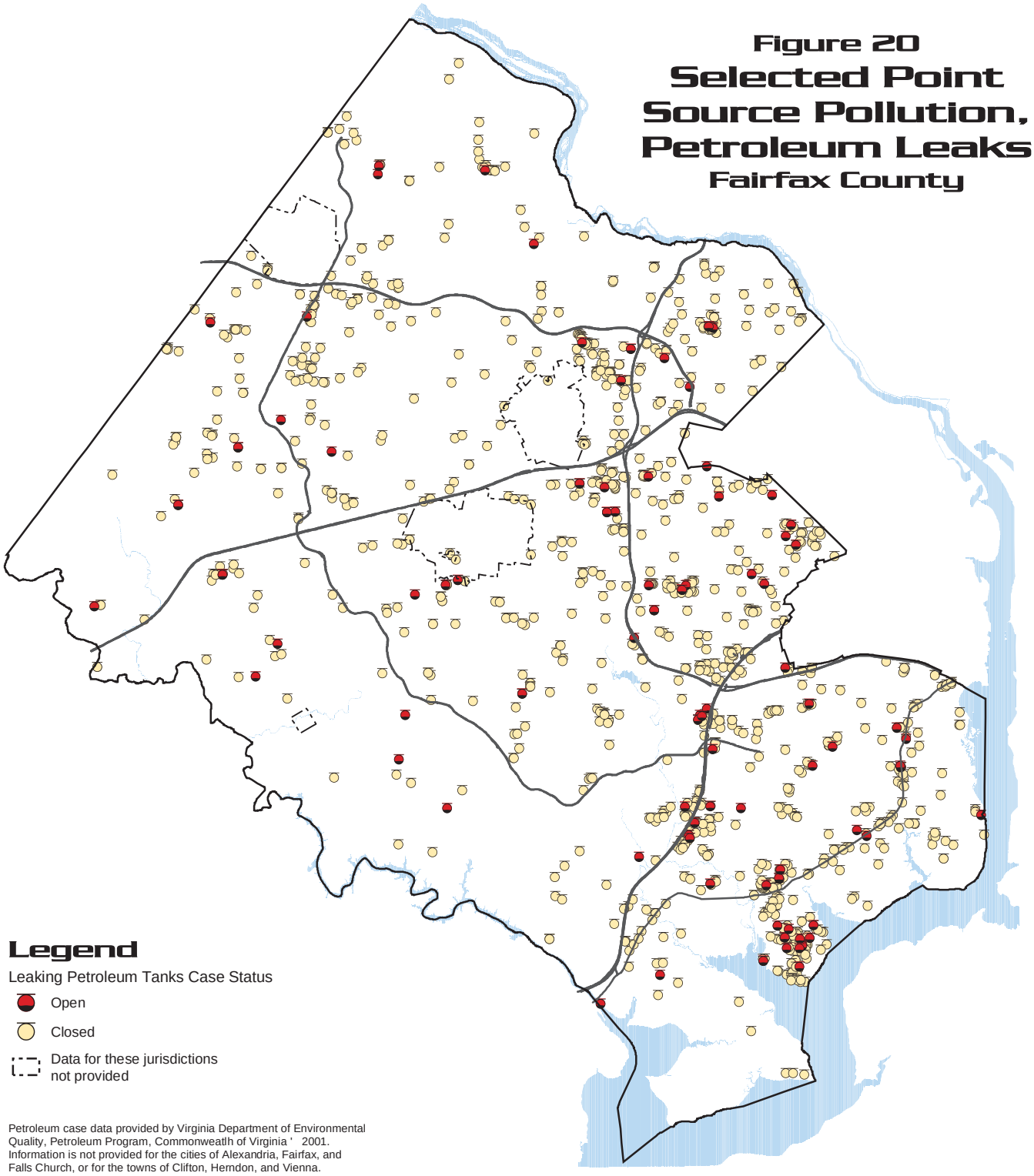
GROUNDWATER POLLUTANTS

STORAGE TANKS

Leaking underground and above ground storage tanks pose a direct threat to surface and groundwater resources. Underground storage tanks (USTs) have been regulated by the federal Resource Conservation and Recovery Act since 1984. In Virginia, the Virginia Department of Environmental Quality (VDEQ) has assumed the authority for implementation and enforcement of these regulations. As of December, 1988, new USTs storing petroleum products and hazardous materials were required to meet certain requirements regarding corrosion protection, overfill and spill prevention, leak detection, and, in the case of USTs storing hazardous materials, secondary containment with measures to detect failures of the innermost containment structure. USTs that were in existence as of that date were required to be upgraded or replaced within a ten-year period. In addition, owners and operators of USTs containing petroleum products and hazardous materials must demonstrate evidence of financial responsibility in the event of a release. Notification forms must be submitted to VDEQ for all USTs storing petroleum products and hazardous materials.

VDEQ maintains a data base of underground storage tanks based on registration data that have been compiled since 1986. As of early 2004, a total of 1,859 underground storage tanks were identified as being in use in Fairfax County. However, according to VDEQ staff, there may be significant error in this figure; it is suspected that a substantial number of USTs that are included in the data base no longer exist. In addition, there may be additional tanks that VDEQ does not

Figure 20
Selected Point Source Pollution, Petroleum Leaks
Fairfax County



have information about. VDEQ is in the process of verifying the information in its data base, but reliable data are not available at this time.

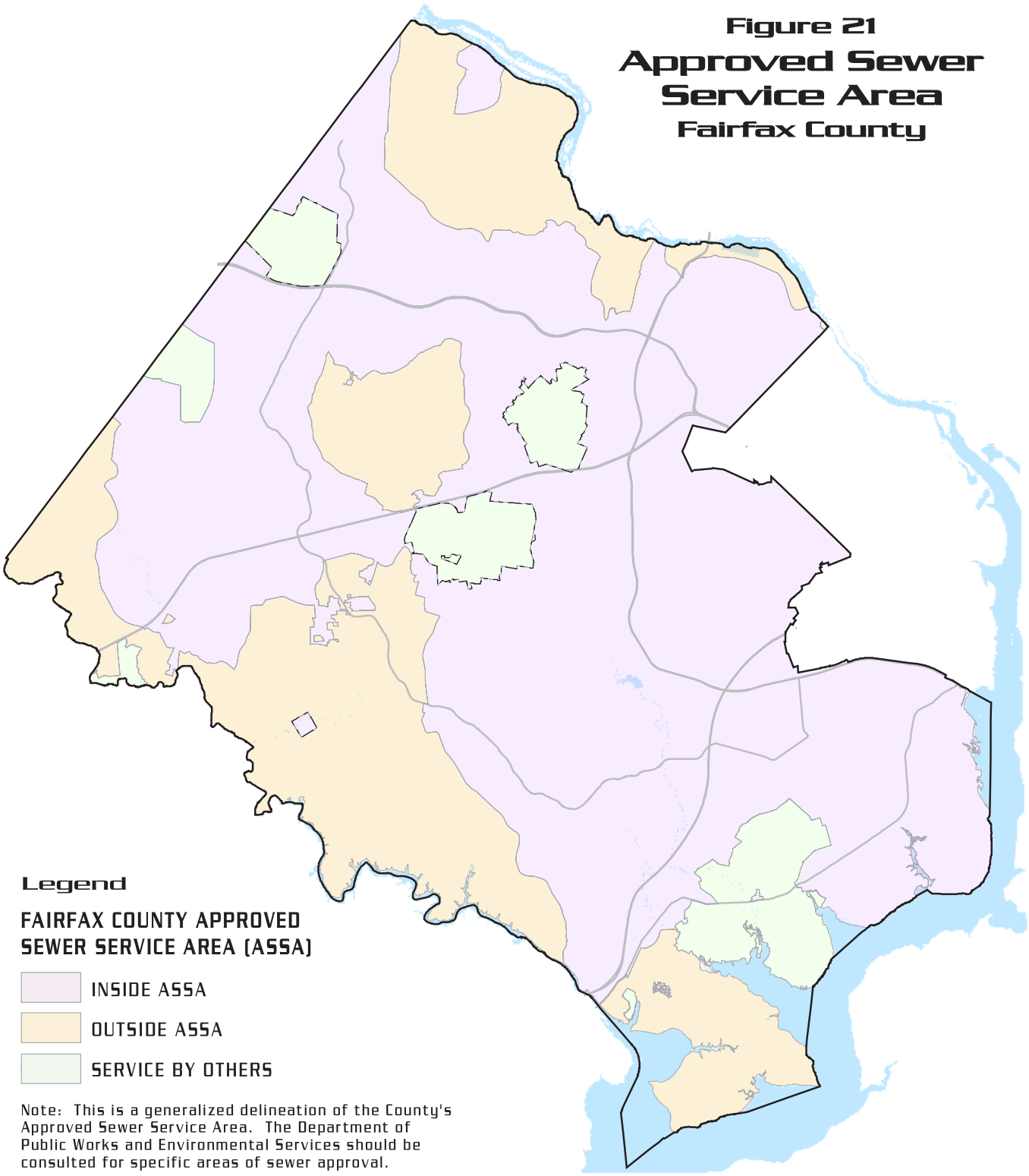
Data regarding open and closed cases of leaking storage tanks (both underground and above ground) are available from VDEQ. The Northern Regional Office of VDEQ has reported that, as of August 2, 2004, there were 168 open cases (and 1,842 closed cases) of leaking storage tanks in Fairfax County (including the Towns of Clifton, Herndon, and Vienna). VDEQ does not have records for all sites with open or closed cases of leaking storage tanks incorporated into its geographic information system (GIS); however, a majority of these data points have been included in the GIS, and VDEQ staff has indicated that the general patterns evident from these data are representative of its overall experiences with leaking storage tanks. Figure 20 presents the VDEQ data regarding leaking storage tanks that have been incorporated into its GIS and that have been made available through the VDEQ Web site; these data are current as of 2001.

Incidences of leaking tanks have occurred throughout the County but have been generally concentrated in commercial, industrial, and institutional areas. While Figure 20 suggests that there are concentrations of such releases in commercial, industrial, and institutional areas, it is the experience of VDEQ that a substantial proportion of the total number of petroleum releases in Fairfax County is related to residential heating oil tanks. Of the 2,010 total cases of leaking storage tanks in Fairfax County, 287, or just over 14%, involved releases from residential heating oil tanks.

Above ground storage tanks are regulated by the Clean Water Act; VDEQ requires registration of any such tank that has a capacity above 660 gallons. Smaller above ground tanks and most above ground home heating oil tanks are not subject to VDEQ registration requirements, although releases from these tanks are regulated. Locally, Fire Prevention Code Permits (issued by the County's Fire and Rescue Department) are required for above ground tanks that are greater than 55 gallons in capacity (30 gallons for liquefied petroleum (LP) gas); however, residential heating tanks are exempt from this requirement, and summary data of local permits are not available. According to the 2000 Census of Population and Housing, 14,567 housing units (4.2% of the County's total) were heated by fuel oil or kerosene in the year 2000 while 3,296 housing units were heated by bottled, tank, or LP gas. Many of the tanks storing these fuels are above ground facilities; however, some of these tanks may be underground tanks. Therefore, information regarding the total number of above ground storage tanks in Fairfax County is not available.

Facilities that store petroleum products or hazardous materials in above ground tanks with an aggregate capacity above 25,000 gallons are required to pursue pollution prevention and contingency measures, such as routine tank inspections, employee training, and the development of soil discharge contingency plans. There are fewer than one dozen such facilities in Fairfax County; these include asphalt and paving facilities, petroleum bulk storage facilities (i.e., tank farms), the Noman M. Cole, Jr. Pollution Control Plant, and a Washington Post facility in Springfield.

Figure 21
Approved Sewer Service Area
Fairfax County



Data regarding releases from above ground storage tanks are not available. However, experiences of the County's Fire and Rescue Department suggest that most releases from such tanks are a result of human error, either due to improper filling of the tanks or to accidental damage to the tanks. Leaks can also occur as a result of corrosion and freezing/thawing of pipes. VDEQ has prepared a fact sheet for owners of home heating oil tanks that offers useful recommendations regarding the placement and routine inspection and maintenance of such tanks and guidance regarding leaks from these tanks. A monthly tank checklist is provided within this brochure.

SANITARY SEWER

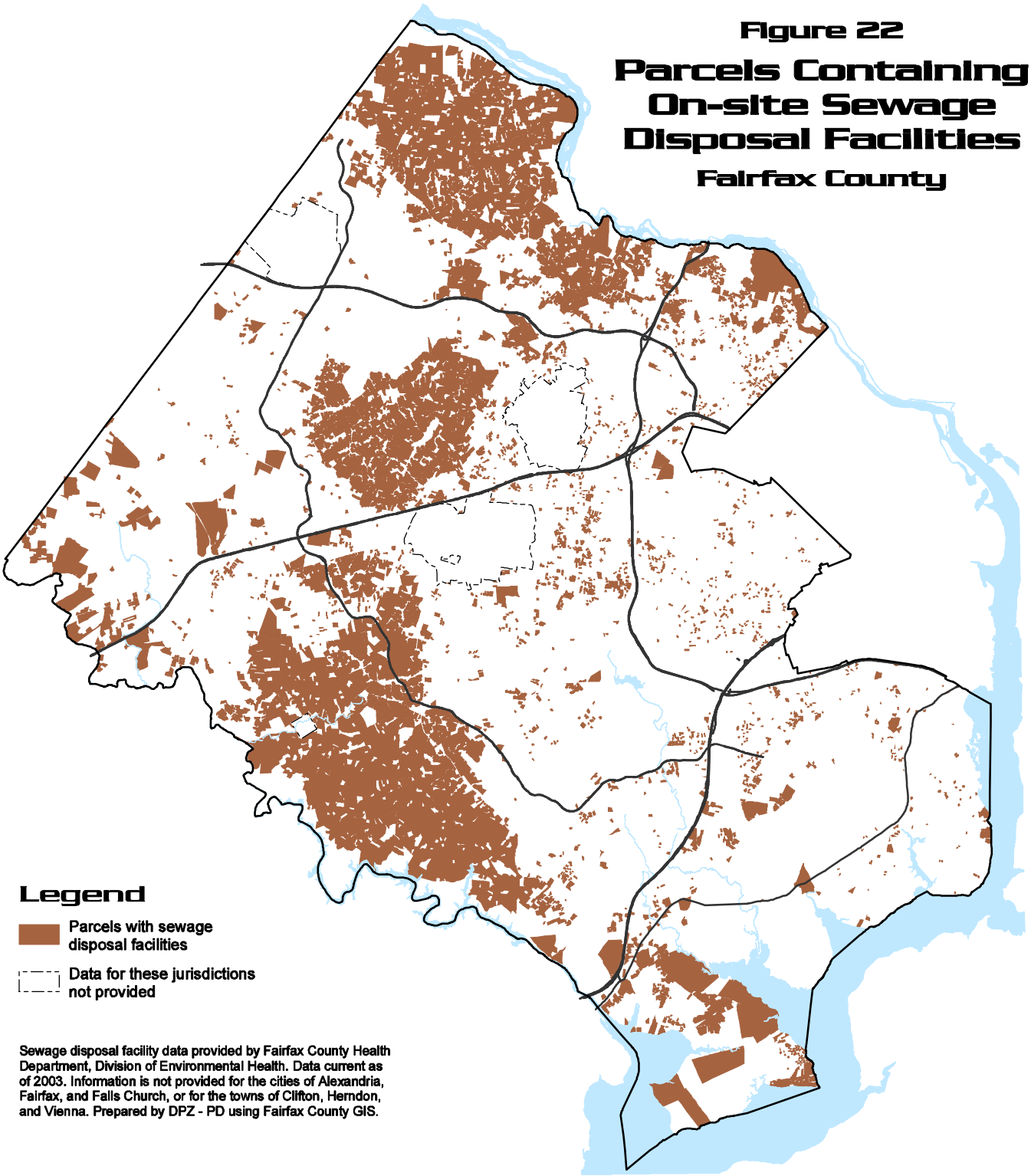
Figure 21 displays the location of the approved sanitary sewer service area in Fairfax County (known as the Board-adopted "Approved Sewer Service Area," or ASSA); this area covers nearly 234 square miles of the County. Fairfax County's policy is to limit the expansion of this area to those areas with densities or intensities of development that require such service and that are contiguous to the existing service area. Expansions of the sanitary sewer service area may also be considered where needed to remedy public health problems caused by failing on-site sewage disposal systems. In general sanitary sewer service is not provided to lower density residential areas. In all, Fairfax County has and maintains approximately 3,145 miles of sanitary sewer lines, 50 sewage flow meters, 61 pumping stations, and 257 sewage grinder pumps. More than 87% of the 360,000 households and virtually all businesses in the County are connected to public sewer.

Leaking sanitary sewer lines can introduce bacterial, nutrient, and other pollutants into the surface water and groundwater systems. As such, the inspection of these lines for leaks and the repair of any leaking pipe is critical to the maintenance and restoration of high quality water resources in Fairfax County. The County's Department of Public Works and Environmental Services (DPWES) maintains a 24-hour emergency response line through which citizens can report sanitary sewer system backups, line breaks, sewage odors, and overflowing manholes. In addition, DPWES has an infiltration abatement program. This program includes evaluations of the sewer system to identify areas with excessive inflow/infiltration problems. In addition, DPWES tests portions of the sanitary sewer system each year through mechanical techniques; closed circuit television inspection is pursued along sewer lines with suspected leaks and in older portions of the sanitary sewer system. Where leaks are detected or suspected, DPWES will pursue repair and rehabilitation efforts, including dig up repairs, manhole rehabilitation, and trenchless pipe repair technologies such as robotic, cured-in-place, and fold-and reformed pipe rehabilitation processes. In 2003, 187 miles of old sewer lines and 34 miles of new sewer lines were inspected, and approximately 26 miles of sanitary sewer lines were rehabilitated. Over 170 miles of sewer line have been rehabilitated over a six year period.

ON-SITE SEWAGE DISPOSAL SYSTEMS

There are approximately 30,000 parcels in Fairfax County with on-site sewage disposal systems. This number changes as older homes are demolished for new development and new homes are built on vacant lots without public sewer. Roughly 99% of these systems are traditional septic systems; other, newer systems are used to a more limited degree. All on-site sewage disposal

Figure 22
Parcels Containing On-site Sewage Disposal Facilities
Fairfax County



systems are regulated by Chapter 68.1 of the Fairfax County Code, which incorporates the Commonwealth of Virginia Sewage Handling and Disposal Regulations by reference.

On-site sewage disposal facilities are concentrated in lower density residential areas of the County, where access to the County's sanitary sewer system is not provided (Figure 22). As noted earlier, it is the County's policy to limit the expansion of the sanitary sewer system to those areas with densities or intensities of development that require such service and that are contiguous to the existing service area. Expansions of the sanitary sewer service area may, however, also be considered where needed to remedy public health problems caused by failing on-site sewage disposal systems.

Properly designed, sited, and maintained septic systems should not pose a threat to groundwater or surface water resources. However, systems that are improperly designed, improperly installed, and/or poorly maintained are likely to have more limited life spans, eventually resulting in system failure and in potential releases of pollutants into surface water and/or groundwater resources. Chapter 68.1 of the Fairfax County Code establishes design, siting, and maintenance requirements for all on-site sewage disposal facilities, including maximum soil percolation rate criteria for drain fields as well as separation distances that must be maintained between septic system components (including drain fields) and a variety of man made and natural features, including surface water resources. All new traditional septic systems are required to have alternating drain fields, a 100 percent reserve drain field area (recently increased from 50%), standardized pump chamber design when applicable, and above ground inspection ports on the septic tank.

Fairfax County's maintenance requirements include mandatory pumping of septic tanks at least once every five years, and annual notices are sent to all system owners advising them of the need to turn the flow diversion valves. Notices for septic tank pump-outs are sent to property owners once every five years; approximately one-fifth of all septic tanks are pumped each year. Even if properly maintained, septic systems will ultimately need to be rehabilitated or replaced.

The County's design, siting, and maintenance requirements have generally been effective in minimizing the extent of contamination associated with on-site sewage disposal. The County is one of only a few counties in the State to require permits for all repairs of septic systems. In Fiscal Year 2003, 995 onsite septic systems were evaluated for system repair as a result of referrals and complaints Countywide. Of these evaluations, 776 repair permits were issued for repair or replacement of mechanical components of the system, with approximately 1% of the permits requiring complete replacement of a failed septic system. This trend has remained steady for the past three years. However, several areas of the County have soils that have slow percolation rates and therefore are poorly suited for traditional on-site sewage disposal systems. An emerging concern in these areas is the advent of technologically advanced, high maintenance alternatives to traditional on-site sewage disposal systems. These facilities have been proposed in Fairfax County at an increasing rate, and the technological complexity of most of these systems and their associated intensive maintenance requirements generate concerns about the ability of property owners to maintain these facilities appropriately. These facilities, when well-maintained, do not present a threat to water resources. However, should these systems not be maintained adequately, they can fail, resulting in the pollution of surface and groundwater

resources. This concern was highlighted in the recent report of the New Millennium Occoquan Watershed Task Force. The County's Environmental Coordinating Committee has appointed an interagency subcommittee to explore solutions to this concern, including the possible establishment of a self-supporting authority to provide for the management of on-site sewage disposal systems. ■